

BUREAU OF WATER

South Carolina Department of Health and Environmental Control

SHELLFISH MANAGEMENT AREA 20

2004 ANNUAL UPDATE

Shellfish Sanitation Program

Water Monitoring, Assessment and Protection Division
Environmental Quality Control - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201

July 2004



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2004 ANNUAL UPDATE

[Data Thru December 2003]

Shellfish Management Area 20 Shellfish Sanitation Program



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TABLE OF CONTENTS

Shellfish Management Area 20 Annual Update

Summary	2
Introduction	3
Pollution Source Survey	6
Survey Procedures	6
Point Source Pollution.....	7
A. Municipal and Community Waste Treatment Facilities	7
B. Industrial Waste.....	8
C. Marinas	8
D. Radionuclides	8
Nonpoint Source Pollution.....	8
A. Stormwater	8
B. Agricultural Waste	10
C. Individual Sewage Treatment and Disposal Systems	10
D. Wildlife and Domestic Animals.....	10
E. Boat Traffic	10
F. Hydrographic and Habitat Modification	10
G. Marine Biotoxins	10
Hydrographic and Meteorological Characteristics	10
Water Quality Studies	12
Conclusions	14
Recommendations	15
References	17
Conditional Area Management Plan	26
Evaluation of Management Plan / Special Data Analyses	

Figures and Tables

Figures:

(1) Shellfish Harvesting Classification Prior to this Survey	19
(2) Current Shellfish Harvesting Classification	20
(3) Potential Pollution Sources.....	21

Tables:

(1) Shellfish Water Quality Sampling Stations Description	18
(2) A: Fecal Coliform Bacteriological Data Summary Sheet (January 01, 2001 - December 31, 2003)	23
B: Conditional Areas Fecal Coliform Bac. Data Summary Sheet (Open Status: January 01, 2001 - December 31, 2003).....	24
(3) Water Quality Sampling Station Data	25
(4) Rainfall Data (January 01, 2001 - December 31, 2003).....	26

ANNUAL UPDATE
Shellfish Management Area 20
SCDHEC EQC Bureau of Water

Data Inclusive Dates:

01/01/01 thru 12/31/03

Classification Change:

X Yes No

Shoreline Survey Completed: Yes

Prior Report & Date: Annual -2003

(I)ncreased/(D)ecreased/(N)one:

 N Approved

 I Conditionally Approved

 D Restricted

 D Prohibited

SUMMARY

The majority of sampling stations in Shellfish Management Area 20 showed a decline in water quality (increased values for geometric mean and/or estimated 90th percentile values) subsequent to the previous sanitary survey. The bacteriological water quality data reflects the return to normal rainfall amounts in 2002 and 2003 following the drought conditions the region experienced from 1999 through 2001.

The Town of Hilton Head has installed a kiosk at the Marshland Road boat landing on Broad Creek. A harvest classification map of the Broad Creek area, an Open/Closed sign for the Conditionally Approved area, and other shellfish harvesting information is included and updated, as appropriate.

More than 60 volunteers cleaned up trash from the marsh and waterways of Broad Creek on March 20, 2004. One hundred ten bags of trash plus larger debris items were collected.

Stormwater appears to adversely affect shellfish water quality within portions of Area 20. The Town of Hilton Head is continuing to incorporate measures to protect water quality into its drainage improvement projects. With increased development, central sewer is replacing septic tanks as the primary method of wastewater treatment and disposal for the majority of new structures in Area 20. See Pollution Source Survey.

The administrative closure zones around all of the marinas in Area 20 are being re-evaluated. For this Annual Update, each of the marinas in Broad Creek (Palmetto Bay Marina, Wexford Marina, Hilton Head Marina/Broad Creek, Long Cove community dock, and Shelter Cove Marina) has been re-delineated on the maps included in this report. These adjustments will result in a decrease in Prohibited and Restricted acreage, as well as a concomitant increase in Conditionally Approved acreage within Broad Creek. Management criteria for the Broad Creek Conditionally Approved area will remain at 1.40 inches per 24 hours, as recorded at the Broad Creek PSD wastewater treatment plant.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47 that provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide For The Control Of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S. C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved - Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. The Approved area classification shall be designated based upon a sanitary survey which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, and not more than ten percent of the samples shall exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform Most Probable Number (MPN) shall not exceed fourteen per one hundred milliliters, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP Guidelines.

Conditionally Approved - Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff,

discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Restricted - Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved classification is not feasible. Shellfish may be harvested from areas classified as Restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Restricted - Growing areas may be classified Conditionally Restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as Conditionally Restricted. Where appropriate, the management plan for each Conditionally Restricted area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems and an evaluation of each source of pollution) and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as Conditionally Restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For Conditionally Restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of Conditionally Restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Prohibited - Growing areas are classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

Shellfish Management Area 20 consists of approximately 22,448 acres of shellfish growing area habitat in Beaufort County, South Carolina. The area is comprised of Calibogue Sound and the Skull, Mackay, Jarvis, Old House, and Broad Creek tributaries. The area's northern boundary originates near the Colleton River, then follows the shoreline of Port Royal Sound, crosses the mouth of Mackay and Skull Creek, and continues to the Atlantic Ocean. The eastern boundary and southern boundaries are defined by the Atlantic Ocean. The western boundary extends northward through the lower portions of Bull Island and May River.

Although the majority of Area 20 is moderately developed, the Hilton Head Island area supports dense development that includes many golf course plantations, shopping malls, restaurants, and marinas. 1995 census data of the island indicates a population of approximately 28,500 permanent residents. During summer months, tourism increases average population to near 70,000. Major holiday periods result in population peaks of approximately 100,000.

The harvesting classifications of Area 20 prior to this survey were as follows:

Prohibited (Administrative closure):

1. Those waters adjacent to Harbor Town marina and 1000 feet northeast and southeast; 1000 feet adjacent to Moss Creek marina; 1000 feet adjacent to Skull Creek Marina; 1000 feet adjacent to Outdoor Resorts marina; 1000 feet adjacent to Windmill Harbor marina, 1000 feet adjacent to South Beach marina including area within line from offshore edge of South Beach Marina closure zone to the offshore edge of Harbor Town marina closure zone;
2. Those waters adjacent to Palmetto Bay marina 100 feet north to the unnamed creek adjacent to Spanish Wells Plantation, extending west to the oyster bank and southward to include the docking area of Haig Point embarkation;
3. Those waters around Shelter Cove marina 1000 feet northeast and southeast from the mouth of the harbor to the oyster bank on the opposite side;
4. Those waters around Wexford Harbor from the unnamed island that extends northeast along Broad Creek to the shoreline northwest of Wexford on the opposite side;
5. Those waters adjacent to Broad Creek marina to 1000 feet south, extending eastward across Broad Creek to the oyster bank and 1000 feet north adjacent to the private docks;
6. Those waters adjacent to the boat docking facilities at Villages on Skull Creek, Hilton Head Plantation, Long Cove, Baynard Cove, Gull Point community, and Schillings Boat House;
7. Those waters in Broad Creek adjacent to the Sea Pines outfall 1000 feet north and south of the mouth of Lawton Creek;
8. Folly Creek, the entire tributary to its confluence with the Atlantic Ocean.

Restricted / No Depuration: None

Restricted:

1. Broad Creek, from the boundary of the Conditionally Approved area at Station 25, to the headwaters, including Station 16;
2. Fish Haul Creek, from its headwaters to its confluence with Port Royal Sound.

Conditionally Approved:

Broad Creek, from Station 03 to Station 25 (excluding all Administratively Prohibited closure zones). The Conditionally Approved area will consist only of the main channel of Broad Creek between stations 04A and 17B, excluding the closure zones. Between stations 17B and 25, the Conditionally Approved area will consist of Broad Creek proper and the adjacent marshes, excluding all closure zones.

Approved: The remaining waters of Area 20.

Station Addition/Deactivation/Modification: None

The shellfish industry in South Carolina is based mainly on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams (*Mercenaria mercenaria*).

Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State Shellfish Grounds, Culture Permits, Recreational Shellfish Grounds, and Kings Grants. There are ten Culture Permit (essentially commercial leases) areas in Area 20. Recreational harvesting is allowed for clams and oysters on all State Shellfish Grounds, and commercial harvesting by licensed individuals is allowed, subject to seasons established by SCDNR. State Shellfish Ground 005 is located on Haig Point; 029 is located in Jarvis Creek; and 048 is at the northern end of Hilton Head Island, beginning at the mouth of Skull Creek and extending into Port Royal Sound. Recreational harvesting only is allowed on the Last End Point Recreational Shellfish Ground R-036).

Shellfish harvesting season in South Carolina extends from September 16 through May 15, although actual dates may vary. SCDNR has the authority to alter the shellfish harvest season for management purposes. The South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that all shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

Shoreline surveys of Area 20 were conducted by the Low Country District Shellfish Sanitation staff, by watercraft, vehicle, and on foot, during the survey period and are ongoing.

POINT SOURCE POLLUTION

Major sources of actual or potential pollution (see Figure 4):

PERMITTED FACILITIES	PERMIT #/TYPE/ DISCHARGE
Water Oaks Utilities/ Moss Creek WWTP	ND0014567/ 0.179 MGD/spray irrigation
Hilton Head PSD # 1	ND0065854/ 1.0 MGD/spray irrigation
Hilton Head PSD # 1/Hilton Head Plantation	SC0043605/ 0.5MGD and 0.15MGD/2 wetlands
Hilton Head PSD # 1/ Palmetto Hall	SC0046191/ 3.2 MGD/ wetlands
Hilton Head PSD# 1	ND0068462/ 3.2 MGD/ spray irrigation
Broad Creek PSD	ND0063100/ 2.085MGD/ spray irrigation
South Island PSD/ Long Cove WWTP	ND0013528/ 0.225 MGD/ spray irrigation
South Island PSD/ Wexford WWTP	ND0017141/ 0.227 MGD/ spray irrigation
South Island PSD / Sea Pines WWTP	ND0064033 / 5.0 MGD/ spray irrigation
South Island PSD / Sea Pines WWTP	SC0042501 / 5.0 MGD/ 2 wetlands
Skull Creek Marina	Marina- with pumpout facilities
Schillings Boathouse	Dry stack marina- no pumpout
Outdoor Resorts marina	Marina- with pumpout
Windmill Harbor marina	Marina- with pumpout
Broad Creek marina	Marina- no pumpout
Shelter Cove marina	Marina- with pumpout
Palmetto Bay marina	Marina- with pumpout
Wexford Lock Harbor	Marina- with pumpout
Harbor Town marina	Marina- with pumpout
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South Beach marina	Marina- no pumpout
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- A. Municipal and Community Waste Treatment Facilities** - There are no direct discharges of wastewater into Area 20 shellfish growing waters. Treated effluent is typically used for spray irrigation of golf courses and landscape areas. Wetland areas are also used for disposal of treated effluent, particularly during periods when the golf courses are too wet to use the water. Although the majority of Hilton Head Island residences are served by sewer, some homes still utilize septic tanks for wastewater treatment and disposal. Many of the homes adjacent to the northern shore of Broad Creek use septic tanks. South Island PSD reported that they have been working on a five- year plan to have all of Sea Pines Plantation on sewer. South Island recently expanded sewer service to include 58 lots in Twin Pines and Stoney Creek subdivisions.

Sewer will be provided to 22 vacant parcels of land (with the potential for up to 90 homes), as well as approximately 48 homes currently utilizing septic tanks in the Muddy Creek Road area. This project is nearing completion.

Construction of a sewer system to provide service to thirty to forty homes in the Folly Field area is underway.

- B. Industrial wastes** -There are no permitted industrial discharges in Area 20.
- C. Marinas** - S.C. Regulation 61-47, Shellfish defines Marina as “any water area with a structure (docks, basin, floating docks, etc.) which is: 1) used for docking or otherwise mooring vessels; and, 2) constructed to provide temporary or permanent docking space for more than ten boats, or has more than 200 linear feet of docking space.” There are ten marinas in Area 20 (see Figure 4).

The administrative closure zones around all of the marinas in Area 20 are being re-evaluated. For this Annual Update, the classification maps indicating marinas in Broad Creek (Palmetto Bay Marina, Wexford Marina, Hilton Head Marina, Long Cove community dock, and Shelter Cove Marina) have been re-drawn with approximate 1000’ Prohibited closures surrounding each facility.

- D. Radionuclides** - The Savannah River is a potential source of Radionuclides in Area 20. A fish consumption advisory is in effect for Strontium-90 and Cesium-137 in the Savannah River between Beech Island in Aiken County to the Webb Wildlife Center in Hampton County. Radionuclide monitoring of oyster tissue conducted in 1998 and 1999 showed levels for Cesium and Strontium at below detection levels.

NONPOINT SOURCE POLLUTION

- A. Stormwater** - Hilton Head Island is a coastal barrier island of approximately 22,000 acres. Over the last 40 years, about 16,525 acres have been developed into 11 planned communities and 21 golf courses. The highest point on the island is 28 feet above mean sea level (m.s.l.) with

the average being approximately 14 feet above m.s.l. Flooding and stormwater drainage have become critical issues on the island due to the low elevations and relatively flat topography.

Within the planned communities on the island, the stormwater drainage systems typically consist of an arrangement of inter-connecting ditches and lagoons. The majority of the island's stormwater is directed to Broad Creek. Broad Creek receives stormwater from five major drainage systems. They are: the Port Royal Plantation system, Palmetto Dunes, Wexford/Shipyard Plantation, Sea Pines/Lawton canal, and Indigo Plantation. Sampling conducted during the Broad Creek Nonpoint Source Assessment study done in 1995/96 confirmed the presence of high levels of fecal coliforms associated with the low salinity waters of the drainage systems.

In the summer of 1996, The Town of Hilton Head was awarded a Section 319 mini-grant to study nonpoint source pollution in Broad Creek. The study found that correlations of fecal coliform concentrations with salinity and rainfall indicate that the contamination occurs in stormwater runoff rather than from other sources such as sewage discharged from marinas. The report identified two primary NPS pollution inputs to Broad Creek as the headwaters region and Lawton Creek.

The Ashmore Tract project is under construction. This area consists of wetlands and forest and has drainage ditches that discharge into the headwaters of Broad Creek at Matthews Drive. The plans include excavating the ditch channel to its original depth, and installing V-notch weirs to increase detention time of water in the ditch. The tributary ditches behind Hilton Head PSD and near the Santee Cooper power station will be blocked with check dams to increase sheet flow (across the wetland area), percolation, and evaporation. In addition, a bio-retention pond near the fire station will be created to create a natural filter for the stormwater.

The Jarvis Creek Park opened to the public on May 5, 2003. Stormwater from the Main Street and Hilton Head Plantation areas will be pumped up into the 11-acre lake where sediment will settle out. The water then flows through a man-made wetland, which absorbs substances such as nitrogen and phosphorus, before reaching Jarvis Creek.

The (former) Captain's Seafood site on Matthews Drive has been acquired by the Town of Hilton Head. A wetlands mitigation site is planned to treat stormwater from Matthews Drive prior to discharge to Broad Creek.

The North Forest Beach project involves installing a stormwater collection system in North Forest Beach and maintenance on existing ditches, which transport stormwater through Shipyard Plantation, under Highway 278 to Wexford Plantation and eventually to Broad Creek. Stormwater pumps are to be installed in Shipyard Plantation and at the discharge point to Broad Creek.

The Beach City Road/Airport drainage project consists of constructing a stormwater detention pond along an existing 8-foot wide outfall channel.

Stormwater runoff impacts water quality by transporting fecal coliform bacteria (and other pollutants) from land to the shellfish growing area. Stormwater from roads, residences, and agricultural land is directed to the lowest point of elevation which is typically the nearest creek or marsh. In addition, there are freshwater wetland areas, ditches, and impoundments which drain into tidal creeks.

Most land disturbing activities in South Carolina must comply with the Stormwater Management and Sediment Reduction Act of 1991. The final regulations, effective on June 26, 1992, establish the procedures and minimum standards for a statewide stormwater management program. For activities in the eight coastal counties, additional water quality requirements are imposed. For all projects, regardless of size, which are located within one-half mile of a receiving water body in the coastal zone, the criteria for permanent water quality ponds having a permanent pool is that they are designed to store the first 1/2 inch of runoff from the entire site over a 24 -hour period or storage of the first one inch of runoff from the built-upon portion of the property, whichever is greater. Storage may be accomplished through retention, detention, or infiltration systems, as appropriate for the specific site. In addition, for those projects which are located within 1000 feet of shellfish beds, the first one and one half inches of runoff from the built-upon portion of the property must be retained on site. Since 1992, these regulations have been applied to the development of residential subdivisions, golf courses, and business areas.

- B. Agricultural Waste** - There are no or large-scale commercial agriculture operations, i.e., herds of cattle or farming activities in Area 20.
- C. Individual Sewage Treatment and Disposal (ISTD) Systems** - While the majority of Hilton Head Island is served by sewer, some homes still utilize septic tanks for wastewater treatment and disposal. Many of the homes adjacent to the northern shore of Broad Creek use septic tanks.

SCDHEC Environmental Health recently has conducted GIS mapping of the location of septic systems on Hilton Head Island, which shows the locations of those systems, which were malfunctioning at the time of the study.

- D. Wildlife and Domestic Animals** - This area supports populations of white-tailed deer, raccoons, wading birds, migratory waterfowl, and other wildlife which may contribute to fecal coliform levels in some areas. Domestic animals present in the area include dogs, cats, horses, and goats. A waste management plan has been developed for Lawton Stables at Sea Pines Plantation. Implementation of the plan was to be completed by September, 1999.
- E. Boat Traffic** - Calibogue Sound provides access to the Atlantic Ocean for commercial and recreational vessels. The Atlantic Intracoastal Waterway (AIWW) runs through Skull Creek and Calibogue Sound to the Cooper River and, eventually, to the Savannah River. Tugs and barges, commercial and recreational vessels utilize this North/South route.

- F. Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval.
- G. Marine Biotoxins** - There have been no documented occurrences of toxic algae affecting water quality in Area 20. The Department participates in a State Task Force on Toxic Algae and maintains a toxic algae emergency response team.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

A tidal node just northeast of May River separates the Broad River estuary and the Savannah River estuary. Skull and Mackey Creeks and their tributaries are part of the Broad River estuary. The Broad River estuary is a drowned river valley system and the largest of Sea Island Coastal Region estuaries (219 square kilometers). This estuary, which includes Broad River, Beaufort River, Port Royal Sound, and several tidal tributaries, includes an extensive system of marshes, tidal creeks, and sea islands.

The majority of Area 20 is part of the Savannah River estuary, a coastal plain system which includes the New, Wright, and Savannah Rivers and several tributaries of Savannah River (e.g., Front, Back, and Middle Rivers and the South Channel).

The average depth of the estuary is approximately 5 meters at mid-tide level. Navigational channels in the lower Savannah and Front Rivers, downstream from Highway 17, range from 9m to 12m in depth and facilitate the intrusion of saltwater into the estuary. The conversion of thousands of acres of saltwater wetlands into diked disposal areas on the South Carolina side could also have altered flow patterns and salinity regimes.

Most tidal exchange occurs through the entrance to Savannah River, primarily through the North Channel; however, limited exchange occurs with the Broad River estuary through Calibogue Sound. The salinity structure is primarily determined by controlled releases of freshwater from impoundments on Savannah River and its tributaries. (NOAA, 1994).

Tides - Tides in Area 20 are semidiurnal, consisting of two low and high tides each lunar day. Mean tidal range is 7.0 feet during normal tides and 8.9 feet above mean low water during spring tides.

The greatest tidal ranges of the year typically occur around full moon during the months of September through December. There is considerable variation in the normal tide range due to the prevailing strength and direction of winds.

Rainfall - Rainfall data for the period subsequent to February 1998 has been collected at the Broad Creek PSD wastewater treatment plant. Rainfall data prior to that date was collected at weather station 384169 located at Hilton Head Island. This station has discontinued operations.

Annual rainfall is normally about 51.36", with August being the wettest month. A chart showing yearly rainfall amounts for the years 1998 through 2003 is attached. Approximately 40% of the annual rainfall falls in the three-month period from June to August. Weather patterns during this time period are often characterized by thunderstorms and shower activity of a short duration. In addition, these three months also have the highest numbers of days with rainfall greater than one inch.

The months of December through March historically have the greatest number of days with rainfall exceeding 0.10" and 0.50". Rainfall events during these months are typically of a longer duration.

Annual rainfall recorded at the Broad Creek PSD weather station was significantly below the 30-year normal amount for 2000 and 2001 (see Chart Hilton Head Annual Rainfall). Below normal rainfall continued through May 2002 and by August 2002, the drought status of all 46 counties in the state, including Beaufort and Colleton, had been upgraded to extreme. Above normal rainfall beginning in late August, however, led the S.C. Drought Response Committee to downgrade the drought status statewide and remove the drought declaration for Beaufort, Charleston, and Colleton counties on November 21, 2002.

Winds - The prevailing wind direction between February and September ranges between South and South Southwest (180 to 200 degrees) and between October and January is North Northeast (20 degrees). The annual mean wind speed is 8.5 MPH, with August having the lowest (7.3 MPH) and March the highest (10.0 MPH) mean wind speed.

River discharges - There are no freshwater rivers that discharge directly into Area 20. The area is part of the Savannah River estuary, whose salinity structure is primarily determined by controlled releases of freshwater from impoundments on Savannah River and its tributaries. The New River receives freshwater input from the Great Swamp. The Wright River receives most of its freshwater input from Savannah River via Fields Cut (AIWW). Highest river discharge usually occurs in late winter and early spring due to heavy precipitation in the Blue Ridge and Piedmont areas; lowest discharge occurs during late summer and fall.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 20 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays, and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated data analysis procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station yet provides a six-sample “cushion” (above the NSSP required 30 minimum) for broken samples, lab error, breakdowns, etc. This also allows each annual report to meet the NSSP Triennial Review sampling criteria.

Nine-hundred and two (902) surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses at 26 active water quality sampling stations in Area 20 during the period 01/01/01 through 12/31/03. Of this total, 866 samples were collected in accordance with the Department’s SRS plan for and used for classification purposes. Previously produced maps indicate Station 21 at an incorrect location, however; all samples have been collected at the proper location defined as Fish Haul Creek at Port Royal Sound. Due to legacy STORET database constraints, Station 21 cannot simply be adjusted and indicated at the correct map location. Station 21 has been deactivated and a new station, 27, was created at this location. Because all data has been collected from the defined location, sample results from stations 21 and 27 will be combined until Station 27 has a minimum of 30 samples.

Sampling at Station 15, Broad Creek at Lawton Creek, was discontinued in November 2002 as the station was located within the administratively Prohibited closure zone for the South Island PSD wastewater treatment plant discharge. Two new stations, 28 and 29, were created in Broad Creek at the Northern and Southern boundaries, respectively, of the closure zone. Each station has twelve sample results for the review period.

The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported by bus to the South Carolina Department of Health and Environmental Control's Trident District Environmental Quality Control laboratory at North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. Upon receipt at the laboratory, sample sets that exceeded a 30-hour holding time or contained a temperature control > 10 degrees C. were discarded. Samples collected after September 1, 1986 have been analyzed using the five tube/three dilution modified A-1 method described by Nuefeld (1985).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using automatic temperature compensated refractometers. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined Nautical Software’s Tides and Currents, Version 2 (1996).

The report, *A Baseline Assessment of Environmental and Biological Conditions in Broad Creek and the Okatie River, Beaufort County, South Carolina* was published in the spring of 2000. The study, conducted by SCDHEC, SCDNR, and the NOAA National Ocean Service, involved a comprehensive assessment of overall water quality, sediment quality, and biological conditions of the two study areas. The report states that system wide, fecal coliform bacteria concentrations were higher in Broad Creek than in the Okatie River. Biotyping of the fecal coliform samples that had *E. coli* indicated

that Broad Creek had both a higher incidence of *E. coli* in the in the samples and a higher percentage of antibiotic resistant strains that were indicative of human sources than the Okatie River. There was also a clear association of areas with high *E.coli* counts related to human sources and obvious pollution sources (land application of treated wastewater and septic tanks) in Broad Creek. However, the majority of stations in both Broad Creek (53.3%) and the Okatie River (80%) were negative for the antibiotic resistance tests used for typing probable sources. This suggests that animal wastes are a major contributor of the fecal coliform levels observed in both systems. (SCDHEC, 2000)

In 1999, Beaufort County was investigating the use of a Special Area Management Plan (SAMP) program to address water quality concerns throughout the county. The Town of Hilton Head Island received a grant for research on Broad Creek and became part of the Beaufort County SAMP. The Town developed a Broad Creek Management Plan, which was published in January 2002.

A water quality monitoring program was initiated in 1999, consisting of bi-weekly sampling at six designated stormwater discharge sites on Broad Creek. The following water quality parameters were sampled: temperature, pH, dissolved oxygen, turbidity, nitrate, fecal coliform bacteria, salinity, ammonia, total nitrogen, and total phosphorus. In addition, tide stage was recorded for each sampling event. All water quality sampling results discussed in the management plan were collected between September 30, 1999 and April 24, 2001. A total of 41 samples were collected and analyzed. None of the stormwater discharge sites on Broad Creek meet the Approved criteria for shellfish harvesting waters. Four of the six sites did meet the standards for primary and secondary contact recreation, crabbing and fishing.

The Town of Hilton Head Island is continuing to monitor 16 land-based water quality sites.

MONITORING RESULTS

Water quality at stations 01, 02, 03, 04A, 05, 06, 07, 09, 10, 11, 12, 13, 15A, 17B, 18, 19A, 20A, 22, 23, 24, 25, and 26 meet the statistical criteria for the Approved classification.

Water quality at stations 16 and combined 21/27 exceeded a fecal coliform MPN geometric mean value of 14 or a fecal coliform MPN estimated 90th percentile value of 43, thus meeting the statistical criteria for a Restricted classification. Stations 28 and 29 are newly created stations lacking the minimum number of samples required for classification.

CONCLUSIONS

Based on review of fecal coliform bacteriological data and the pollution source survey, Area 20 is impacted by three sources of actual or potential pollution.

NONPOINT SOURCE RUNOFF

Stormwater runoff appears to be the major source of fecal coliform bacteria contamination in Area 20. Stormwater runoff from roads or parking lots discharges directly into the creeks or marsh or

enters stormwater lagoons that are usually inter-connected and eventually discharge to a creek. Possible sources of fecal coliform bacteria contamination include pets, wildlife, domestic animals such as horses and cows, failing septic systems, and drainage from roads and freshwater wetlands.

INDIVIDUAL SEWAGE TREATMENT AND DISPOSAL SYSTEMS

The SCDHEC Environmental Health GIS mapping study identified homes with malfunctioning or questionable Individual Sewage Treatment and Disposal Systems (ISTDS) which may impact waters of Area 20.

The report, *A Baseline Assessment of Environmental and Biological Conditions in Broad Creek and the Okatie River, Beaufort County, South Carolina* states that there was a clear association of areas with high *E.coli* counts related to human sources and obvious pollution sources (land application of treated wastewater and septic tanks) in Broad Creek.

BOATING IMPACTS

A large number of vessels utilizing the Atlantic Intracoastal Waterway (AIWW) pass through Area 20, and the occupants of some these vessels may spend periods of time aboard their vessels at one of the marinas or anchored in the creeks. Ample sewage pumpout facilities exist and marina operators are conscientious but there is still a potential for discharge of untreated or partially treated sewage. The designation of Broad Creek as a No Discharge Zone along with increased public awareness should help. Boat wakes also may cause re-suspension of fecal coliform bacteria in sediments.

RECOMMENDATIONS

The shoreline survey and bacteriological data review of shellfish Management Area 20 indicates that changes in classification boundaries within the Broad Creek portion of Area 20 are warranted. The administrative closure zones around all of the marinas in Area 20 are being re-evaluated. For this Annual Update, maps indicating the marinas in Broad Creek (Palmetto Bay Marina, Wexford Marina, Hilton Head Marina/Broad Creek, Long Cove community dock, and Shelter Cove Marina) have been redrawn indicating approximate 1000' Prohibited closures. These recommended adjustments will result in a decrease in Prohibited and Restricted acreage, as well as a concomitant increase in Conditionally Approved acreage within Broad Creek.

Water quality at stations 03, 15A, 04A, 17B, 18, 24 and 25 in Broad Creek currently meets the statistical criteria for Approved classification. However, due to potential water quality variability along with the knowledge that stormwater runoff can have an adverse impact on water quality and public health, the harvest classification of these stations is recommended to remain Conditionally Approved. The Conditionally Approved area is recommended to extend upstream from Stations 03 to Station 25, excluding all administratively Prohibited closure zones. Management criteria for the Broad Creek Conditionally Approved area is recommended to remain at 1.40 inches per 24 hours, as recorded at the

Broad Creek PSD wastewater treatment plant.

Station 16 exceeded a fecal coliform MPN geometric mean value of 14 and a fecal coliform MPN estimated 90th percentile of 43, thereby meeting the statistical criteria for a Restricted classification.

Analysis of the sampling data was conducted to determine if a correlation between rainfall and fecal coliform concentrations existed so that a Conditionally Approved classification could be applied. The amount of rainfall was too low to practically manage the area as Conditionally Approved. Therefore, Broad Creek, from Station 25 to the headwaters (including Station 16), is recommended to remain classified as Restricted.

Relaying and container relaying of shellfish from Restricted areas to Approved areas, and depuration are other options available for harvest of shellfish within Restricted areas in Area 20.

The following growing waters classification of Area 20 is recommended (see Figure 3):

Prohibited (Administrative closure):

1. Those waters adjacent to Harbor Town Marina and approximately 1000 feet northeast and southeast; approximately 1000 feet adjacent to Moss Creek marina; approximately 1000 feet adjacent to Skull Creek Marina; approximately 1000 feet adjacent to Outdoor Resorts marina; approximately 1000 feet adjacent to Windmill Harbor Marina, approximately 1000 feet adjacent to South Beach marina including area within line from offshore edge of South Beach Marina closure zone to the offshore edge of Harbor Town marina closure zone;
2. Those waters within approximately 1000 feet of the marinas and docking facilities in Broad Creek. These facilities include Palmetto Bay Marina, Shelter Cove Marina, Wexford Harbor, Broad Creek Marina, and the Long Cove community dock.
3. Those waters adjacent to the boat docking facilities at Villages on Skull Creek, Hilton Head Plantation, Baynard Cove, Gull Point community, and Schillings Boat House;
4. Those waters in Broad Creek adjacent to the Sea Pines outfall approximately 1000 feet north and south of the mouth of Lawton Creek;
5. Folly Creek, the entire tributary to its confluence with the Atlantic Ocean.

Restricted / No Depuration: None

Restricted:

1. Broad Creek, from the boundary of the Conditionally Approved area at Station 25, to the headwaters, including Station 16;
2. Fish Haul Creek, from its headwaters to its confluence with Port Royal Sound.

Conditionally Approved:

Broad Creek, from Station 03 to Station 25 (excluding all administratively Prohibited closure zones).

Approved: The remaining waters of Area 20.

Station Addition/Deactivation/Modification: None

Analysis of sampling data for Area 20 demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24 hour period. Therefore, a precautionary closure of Area 20 will be implemented following rainfall events of greater than 4.00" in a 24 hour period, as measured at Broad Creek PSD WWTP. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States has been published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (*National Research Council, 1985*).

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TABLE #1
Shellfish Management Area 20
WATER QUALITY SAMPLING STATIONS DESCRIPTION

<u>Station</u>	<u>Description</u>
01	Braddock Point- South end of Hilton Head Island
02	Calibogue Sound, Marker 32
03	Shark Bank and Broad Creek, Marker 2
04A	Broad Creek at Palmetto Bay Marina CSZ
05	May River at Calibogue Sound
06	Jarvis Creek at Calibogue Sound
07	Buckingham Landing at bridge
09	Mackey Creek and Chechessee River
10	Skull Creek at small creek from Mariner's Cove
11	Skull Creek, Marker 19
12	Skull Creek behind Hilton Head Seafood Company
13	Skull Creek and Port Royal Sound
15A	Broad Creek at Calibogue Sound- North end of Buck Island
16	Creek behind Lynn Smith's Oyster Plant at Broad Creek
17B	Broad Creek at Broad Creek Marina CZ
18	Shelter Cove Marina
19A	Broad Creek at Harbour Town Marina CZ
20A	Moss Creek Marina CZ
22	Old House Creek at Calibogue Sound
23	Jarvis Creek at first major 'T'
24	Broad Creek at 1st major creek upstream of station 18
25	Broad Creek at confluence of channel leading to Old Oyster Factory
26	Northwest of South Beach Marina closure zone
27	Fish Haul Creek at Port Royal Sound (new)
28	Broad Creek at Southern boundary of South Island WWTP Prohibited closure zone (new)
29	Broad Creek at Northern boundary of South Island WWTP Prohibited closure zone (new)
(Total Active 27)	

Figure 1.
Shellfish Management
Area 20
Prior Classification

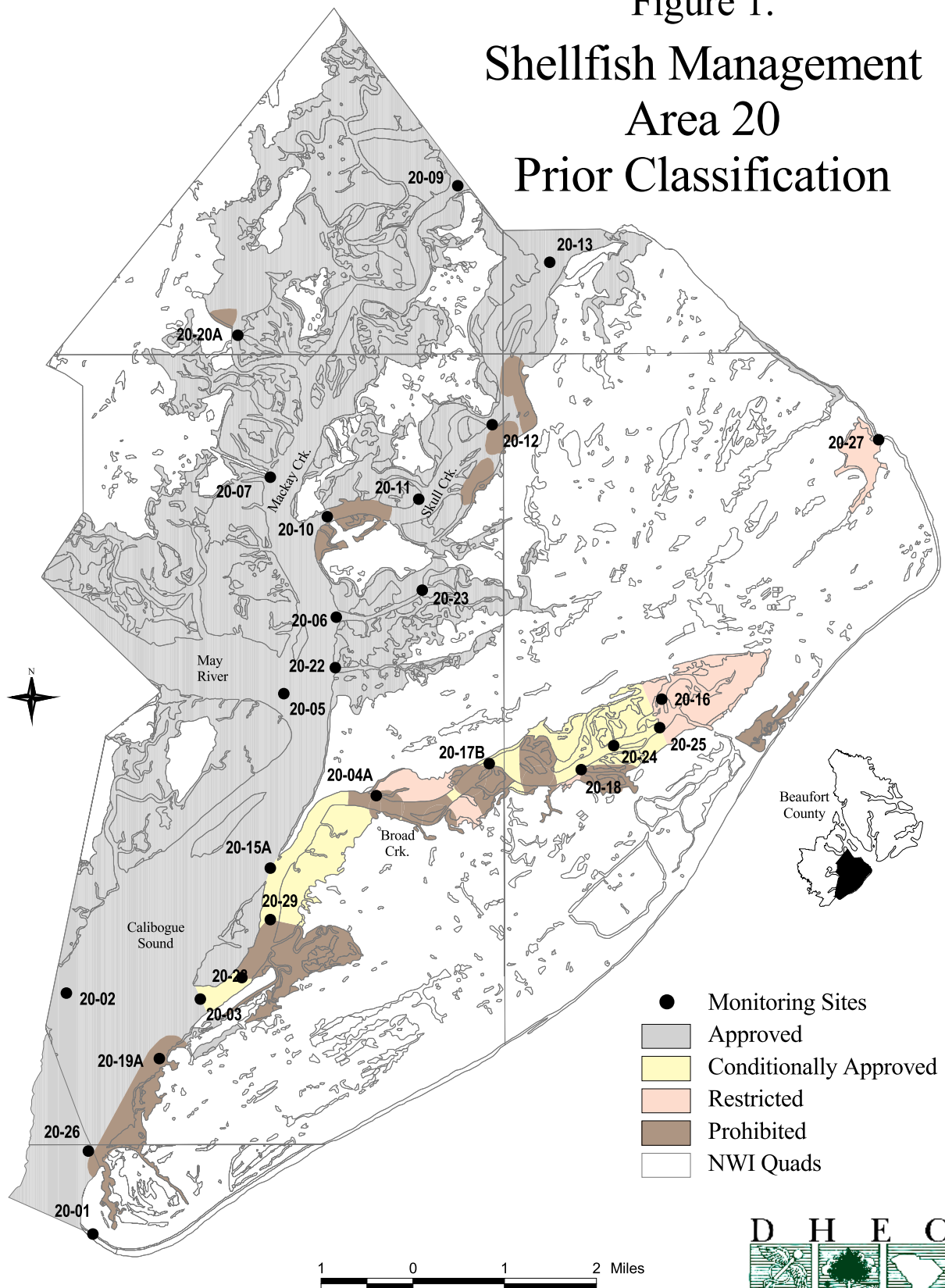


Figure 2.
Shellfish Management
Area 20
Current Classification

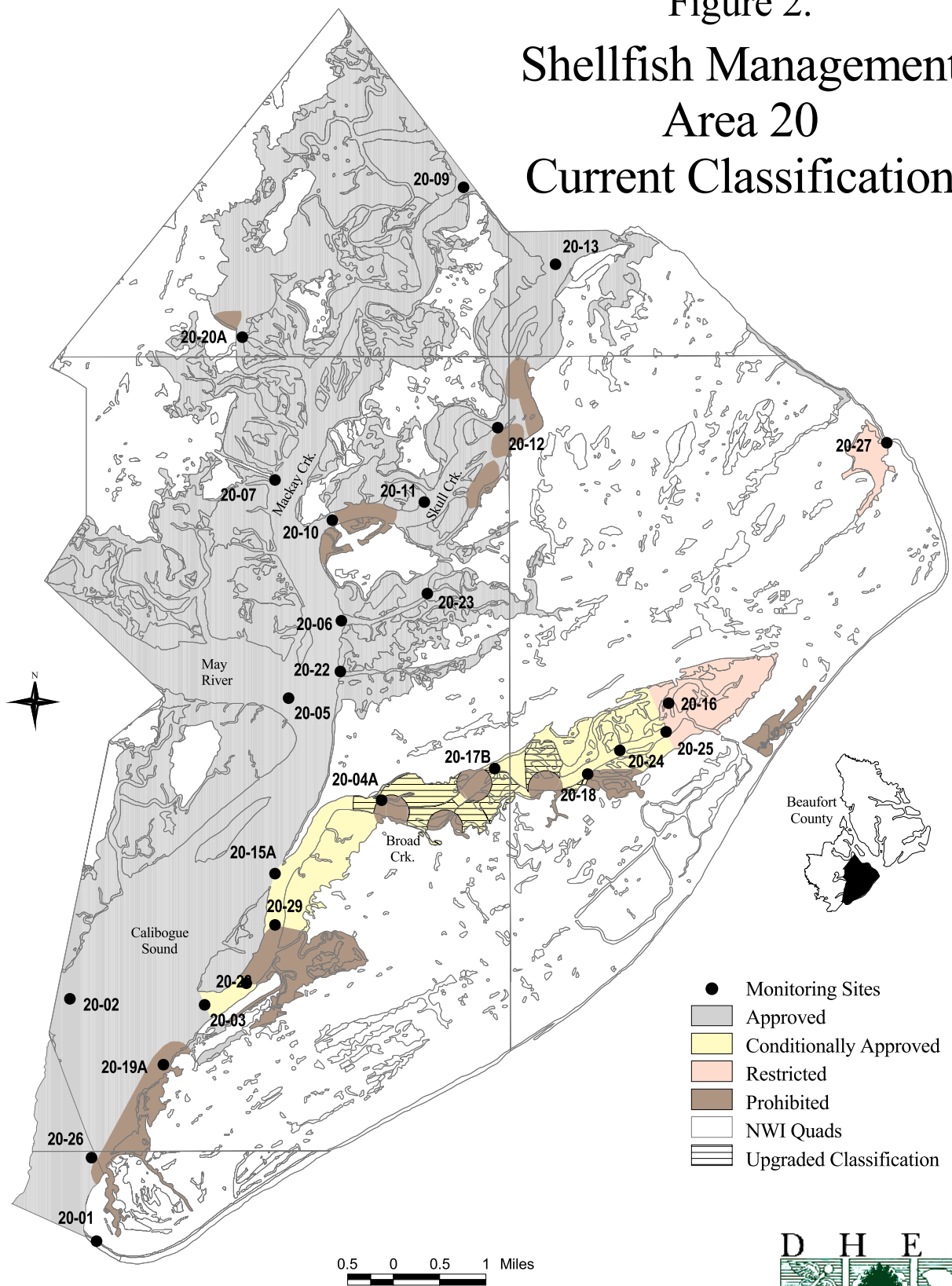


Figure 3.
Shellfish Management
Area 20
Potential
Pollution Sources

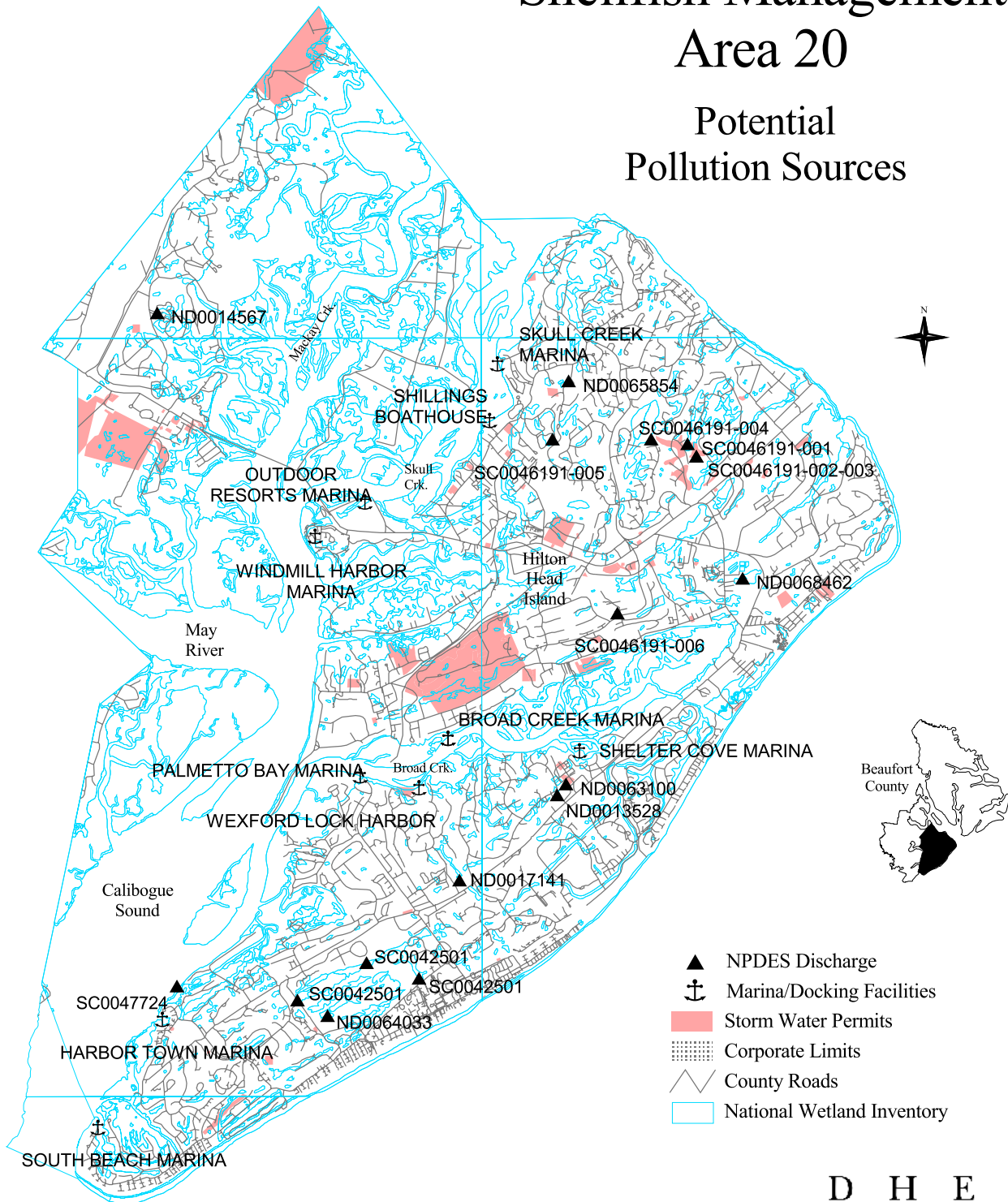


TABLE #2
Shellfish Management Area 20
FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Shellfish Water Quality Sampling Stations between

January 1, 2001 and December 31, 2003

Station # ?	1	2	3	4A	5	6	7	9	10	11	12
SAMPLES	36	36	36	36	36	36	36	36	36	36	35
GEO MEAN	2.5	2.3	3.0	7.4	2.5	4.0	3.3	2.5	3.7	3.2	3.2
90TH%ILE	4	3	8	22	5	12	9	4	13	8	8
WATER QUALITY	A	A	A	A	A	A	A	A	A	A	A
CLASSIFICATION	A	A	CA	CA	A	A	A	A	P	A	A

Station # ?	13	15A	16	17B	18	19A	20A	22	23	24	25
Samples	35	36	36	36	36	36	36	36	36	36	36
GeoMean	3.4	6.2	12.1	5.8	6.0	2.4	3.9	3.8	4.9	6.8	6.0
90th%ile	10	20	76	16	20	5	11	13	17	25	21
Water Quality	A	A	R	A	A	A	A	A	A	A	A
CLASSIFICATION	A	CA	R	CA	CA	A	A	A	A	CA	R

Station # ?	26	27/21	28	29							
Samples	36	36	12	12							
GeoMean	2.7	16.6	6.0	5.1							
90th%ile	5	125	15	16							
Water Quality	New	R	New	New							
CLASSIFICATION	New	R	New	New							

A - Approved CA - Conditionally Approved R - Restricted
RND - Restricted/No Depuration P - Prohibited

TABLE #2 (B)
Shellfish Management Area 20

FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Conditional Management Area Stations
collected while in Open Status between

January 1, 2001 and December 31, 2003

Station # ?	03	04A	15A	17B	18	24	25				
SAMPLES	23	23	23	23	23	23	23				
GEOMEAN	3.1	6.4	5.4	5.2	5.8	7.3	5.3				
90TH %ILE	8	19	17	15	19	25	21				
WATER QLTY	A	A	A	A	A	A	A				
CLASSIFICATION	CA	CA	CA	CA	CA	CA	CA				

Station # ?											
SAMPLES											
GEOMEAN											
90TH %ILE											
WATER QLTY											
CLASSIFICATION											

Station # ?											
SAMPLES											
GEOMEAN											
90TH %ILE											
WATER QLTY											
CLASSIFICATION											

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #3

Water Quality Sampling Stations Data

Shellfish Management Area 20

BACTERIOLOGICAL DATA

Data for each shellfish station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained through South Carolina's Department of Health and Environmental Control - Freedom of Information office at the address below.

Freedom of Information
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

TABLE #4

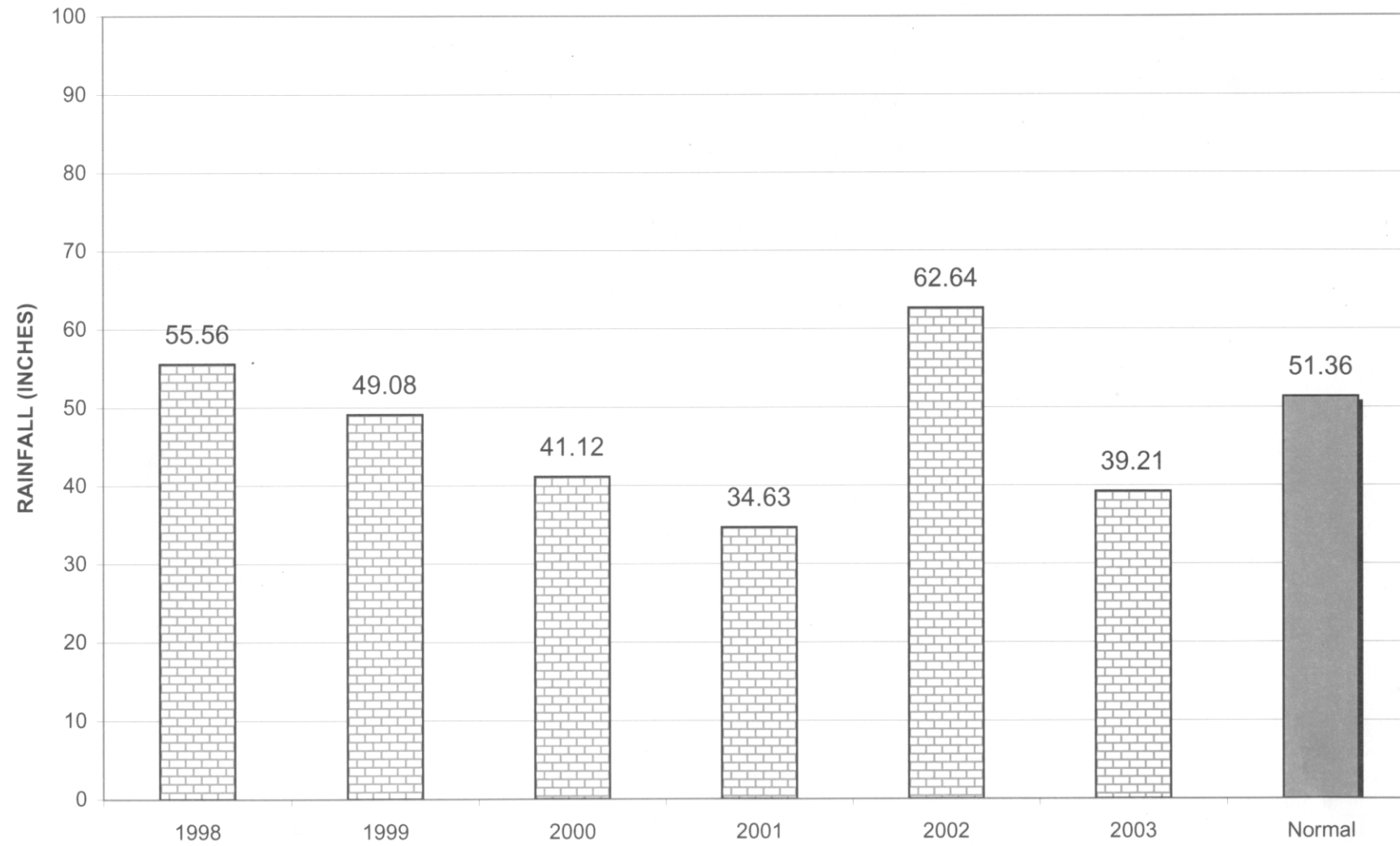
Rainfall Data

Shellfish Management Area 20

SOURCE : NOAA/National Weather Service
National Climatic Data Center, Asheville, North Carolina 28801

Broad Creek Public Service District WWTP

HILTON HEAD ANNUAL RAINFALL 1998-2003



ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: NOAA National Weather Services National Climatic Data Center
Ashville, NC 28801 (Broad Creek Public Service District WWTP)*

2001	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.01	0.00	0.00	0.00	0.00	0.20	0.00	0.05	0.00	0.01	0.00
2nd	0.00	0.01	0.07	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
3rd	0.00	0.25	0.16	0.03	0.00	0.61	0.65	0.00	1.14	0.00	0.00	0.00
4th	0.00	0.00	0.32	0.00	0.00	0.00	0.18	0.00	2.13	0.00	0.01	0.00
5th	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.46	1.11	0.00	0.00	0.00
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
7th	0.20	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.19
8th	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.01	0.00	0.00	0.00
9th	0.00	0.00	0.01	0.00	0.00	0.46	0.00	0.00	0.14	0.00	0.00	0.00
10th	0.00	0.12	0.00	0.00	0.00	0.08	0.00	0.04	0.24	0.05	0.00	0.69
11th	0.03	0.01	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.35
12th	0.03	0.37	0.70	0.00	1.68	0.14	0.04	0.00	0.21	0.00	0.00	0.00
13th	0.00	0.00	0.04	0.02	0.00	0.33	0.17	0.45	0.05	0.00	0.00	0.00
14th	0.00	0.00	0.20	0.00	0.00	0.05	0.00	0.30	0.30	0.00	0.00	0.00
15th	0.00	0.00	0.51	1.02	0.00	0.02	0.00	0.04	0.06	0.19	0.01	0.01
16th	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	0.03	0.00	0.00	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.01
18th	0.02	0.00	0.01	0.00	0.00	0.01	0.00	1.63	0.00	0.00	0.01	0.24
19th	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.01
20th	0.27	0.00	1.12	0.00	0.00	0.01	2.19	0.70	0.00	0.01	0.00	0.00
21st	0.00	0.00	0.01	0.00	0.00	0.31	1.30	0.00	0.00	0.00	0.00	0.00
22nd	0.33	0.11	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00
23rd	0.71	0.00	0.00	0.00	0.09	0.00	1.07	0.00	0.27	0.01	0.02	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.12	0.71	0.00	0.01	0.00
25th	0.00	0.21	0.23	0.66	0.00	0.86	0.00	0.00	0.03	0.00	0.00	0.00
26th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27th	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28th	0.00	0.00	0.13	0.00	0.03	0.05	0.18	0.00	0.00	0.00	0.01	0.00
29th	0.00		0.52	0.00	0.15	0.00	0.03	0.00	0.00	0.00	0.00	0.00
30th	0.09		0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.00		0.00		0.00	0.00		0.00		0.00

(Monthly Figures)

Year's Rainfall Total: 34.63

SUM	1.68	1.12	4.49	1.74	1.96	4.35	6.43	4.54	6.46	0.26	0.09	1.51
MAX	0.71	0.37	1.12	1.02	1.68	0.92	2.19	1.63	2.13	0.19	0.02	0.69
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.05	0.04	0.14	0.06	0.06	0.15	0.21	0.15	0.22	0.01	0.00	0.05

Note:"--" denotes missing data
(Shellfish Management Area 20)

ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: NOAA National Weather Services National Climatic Data Center
Ashville, NC 28801 (Broad Creek Public Service District WWTP)*

2002	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.01	0.00	0.32	0.00	0.00	0.00	0.00	0.44	0.27	0.01	0.00
2nd	0.80	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00
3rd	0.02	0.00	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00
5th	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.04	0.66
6th	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.45	0.00
7th	0.00	1.03	0.01	0.00	0.00	0.00	0.62	0.00	0.00	0.15	0.00	0.00
8th	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	1.20	0.01	0.01
9th	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.19
10th	0.00	0.17	0.00	0.23	0.00	0.00	0.00	0.00	0.00	1.10	0.08	0.61
11th	0.00	0.01	0.00	0.04	0.00	0.00	0.16	0.00	0.00	0.37	0.07	0.08
12th	0.80	0.00	0.36	0.00	0.00	0.00	0.87	0.00	0.00	0.00	1.25	0.05
13th	0.27	0.00	0.03	0.00	0.14	0.00	0.07	0.37	1.93	0.02	0.46	0.52
14th	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.00
15th	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.21	0.51	0.00	0.00
16th	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00
17th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00
18th	0.00	0.00	0.00	0.00	0.96	0.34	0.00	1.37	0.08	0.00	0.00	0.00
19th	0.02	0.00	0.00	0.00	0.87	0.06	0.00	0.00	3.27	0.00	0.01	0.02
20th	0.00	0.08	0.00	0.00	0.00	1.46	0.13	0.00	0.01	0.00	0.00	0.07
21st	0.05	0.02	0.23	0.00	0.00	1.56	0.01	0.00	0.01	0.00	0.08	0.00
22nd	0.00	0.01	0.00	0.00	0.00	4.16	0.00	0.29	0.00	0.00	0.00	0.00
23rd	0.00	0.10	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.51	0.02	0.01	1.19
25th	0.09	0.00	0.00	0.08	0.00	0.58	0.00	0.72	1.05	0.01	0.00	0.02
26th	0.00	0.02	0.19	0.00	0.00	0.11	0.34	2.44	0.40	0.00	0.01	0.00
27th	0.00	0.00	0.15	0.00	0.00	0.01	0.01	2.03	0.66	0.01	0.01	0.00
28th	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.94	0.00	1.28	0.00	0.00
29th	0.00		0.00	0.00	0.00	0.00	0.00	1.41	0.15	0.05	0.00	0.00
30th	0.01		0.00	0.00	0.01	0.00	0.00	3.80	0.01	0.58	0.00	0.00
31st	0.01		0.17		0.00		0.00	3.44		0.00		0.22

(Monthly Figures)

Year's Rainfall Total: 62.64

SUM	2.72	1.90	3.69	0.67	1.98	9.40	2.28	17.68	8.89	5.65	4.14	3.64
MAX	0.80	1.03	1.33	0.32	0.96	4.16	0.87	3.80	3.27	1.28	1.40	1.19
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.09	0.07	0.12	0.02	0.06	0.31	0.07	0.57	0.30	0.18	0.14	0.12

Note: "--" denotes missing data
(Shellfish Management Area 20)

ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: NOAA National Weather Services National Climatic Data Center
Ashville, NC 28801 (Broad Creek Public Service District WWTP)*

2003	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.05	0.00	0.65	0.00	0.03	0.00	0.48	0.03	0.00	0.00	0.01	0.00
2nd	0.00	0.00	0.12	0.00	0.20	0.00	0.06	0.00	0.06	0.01	0.00	0.00
3rd	0.02	0.00	0.03	0.00	0.20	0.31	0.03	0.00	0.00	0.00	0.01	0.00
4th	0.00	0.14	0.52	0.00	0.00	0.26	0.04	0.36	0.22	0.00	0.11	1.17
5th	0.00	0.01	0.01	0.08	0.00	0.00	0.00	0.15	0.49	0.01	0.00	0.00
6th	0.00	0.01	0.81	0.00	0.45	0.28	0.00	1.41	2.63	0.00	0.00	0.00
7th	0.00	0.24	1.48	0.64	0.00	0.31	0.00	0.02	0.10	0.05	0.00	0.00
8th	0.00	0.00	0.00	0.99	0.00	0.89	0.00	0.07	0.07	0.17	0.08	0.01
9th	0.00	0.07	0.00	0.55	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.01
10th	0.00	0.24	0.02	0.19	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.34
11th	0.00	0.00	0.00	0.10	0.53	0.00	0.00	0.02	0.00	0.02	0.01	0.01
12th	0.00	0.00	0.00	0.00	0.01	0.00	0.24	0.00	0.01	0.00	0.00	0.00
13th	0.00	0.00	0.31	0.00	0.00	0.04	0.01	0.00	0.00	0.02	0.00	0.03
14th	0.00	0.00	0.28	0.01	0.00	0.39	1.24	0.00	0.00	0.25	0.00	0.64
15th	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.01	0.01
16th	0.02	0.92	0.01	0.00	0.09	0.27	0.00	0.00	0.00	0.00	0.01	0.02
17th	0.01	0.05	0.81	0.00	0.01	0.11	0.49	0.00	0.00	0.00	0.00	0.01
18th	0.00	0.00	0.06	0.00	0.85	0.00	0.00	0.01	0.00	0.00	0.24	0.00
19th	0.00	0.01	0.34	0.00	0.01	0.08	0.62	0.00	0.00	0.01	0.04	0.00
20th	0.00	0.02	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
21st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
22nd	0.28	0.39	0.00	0.00	0.51	0.00	0.05	0.00	0.00	0.00	0.00	0.01
23rd	0.04	0.00	0.00	0.00	0.34	0.00	0.31	0.00	0.51	0.00	0.01	0.01
24th	0.00	0.00	0.00	0.00	0.01	0.00	0.58	0.00	0.01	0.00	0.02	0.01
25th	0.00	0.00	0.00	0.53	0.53	0.00	0.30	0.00	0.00	0.05	0.00	0.00
26th	0.00	0.04	0.00	0.01	0.01	0.00	0.95	0.00	0.04	0.00	0.01	0.01
27th	0.00	0.55	0.00	0.00	0.06	0.00	0.13	0.00	0.02	0.19	0.01	0.03
28th	0.00	0.00	0.00	0.00	0.00	0.12	0.01	0.00	0.00	3.58	0.23	0.01
29th	0.00		0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.01	0.00	0.01
30th	0.00		0.26	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.00		0.00		0.00	0.03		0.00		0.00

(Monthly Figures)

Year's Rainfall Total: 39.20

SUM	0.42	2.69	6.38	3.12	3.86	3.09	5.56	2.23	4.31	4.38	0.82	2.34
MAX	0.28	0.92	1.48	0.99	0.85	0.89	1.24	1.41	2.63	3.58	0.24	1.17
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.01	0.10	0.21	0.10	0.12	0.10	0.18	0.07	0.14	0.14	0.03	0.08

Note:"--" denotes missing data
(Shellfish Management Area 20)

Shellfish Management Area 20
A SUMMARY OF RAINFALL
DURING AND PRIOR TO FECAL COLIFORM SAMPLING

Sample Date	Sample Date + 24 hours	Sample Date	Sample Date - 24 hours	Sample Date - 48 hours	Sample Date - 72 hours
01/10/01	0.03"	0.00"	0.00"	0.00"	0.20"
02/14/01	0.00"	0.00"	0.00"	0.37"	0.01"
03/28/01	0.52"	0.13"	0.00"	0.00"	0.23"
04/04/01	0.00"	0.00"	0.03"	0.00"	0.00"
05/29/01	0.00"	0.15"	0.03"	0.01"	0.00"
06/11/01	0.14"	0.08"	0.08"	0.46"	0.25"
07/24/01	0.00"	0.23"	1.07"	0.00"	1.30"
08/21/01	0.00"	0.00"	0.70"	0.80"	1.63"
09/10/01	0.00"	0.24"	0.14"	0.01"	0.00"
10/01/01	0.00"	0.00"	0.00"	0.00"	0.00"
11/05/01	0.00"	0.00"	0.01"	0.00"	0.00"
12/18/01	0.01"	0.24"	0.01"	0.00"	0.01"
01/08/02	0.00"	0.00"	0.00"	0.34"	0.00"
02/05/02	0.22"	0.00"	0.00"	0.00"	0.00"
03/13/02	0.00"	0.03"	0.36"	0.00"	0.00"
04/17/02	0.00"	0.00"	0.00"	0.00"	0.00"
05/01/02	0.00"	0.00"	0.00"	0.00"	0.00"
06/12/02	0.00"	0.00"	0.00"	0.00"	0.00"
07/30/02	0.00"	0.00"	0.00"	0.00"	0.01"
08/20/02	0.00"	0.00"	0.00"	1.37"	0.00"
09/18/02	3.27"	0.08"	0.00"	0.00"	0.21"
10/08/02	0.04"	1.20"	0.15"	0.00"	0.00"
11/19/02	0.00"	0.01"	0.00"	0.13"	1.40"
12/17/02	0.00"	0.00"	0.00"	0.00"	0.00"
01/15/03	0.02"	0.00"	0.00"	0.00"	0.00"
02/25/03	0.04"	0.00"	0.00"	0.00"	0.39"
03/11/03	0.00"	0.00"	0.02"	0.00"	0.00"
04/15/03	0.00"	0.01"	0.01"	0.00"	0.00"
05/12/03	0.00"	0.01"	0.53"	0.00"	0.00"
06/17/03	0.00"	0.11"	0.27"	0.00"	0.39"
07/17/03	0.00"	0.49"	0.00"	0.01"	1.24"
08/05/03	1.41"	0.15"	0.36"	0.00"	0.00"
09/15/03	0.00"	0.00"	0.00"	0.00"	0.01"
10/08/03	0.00"	0.17"	0.05"	0.00"	0.01"
11/19/03	0.01"	0.04"	0.24"	0.00"	0.01"
12/16/03	0.01"	0.02"	0.01"	0.64"	0.03"

[Amounts Shown Are per Day, not Cumulative] Rainfall data supplied by Broad Creek PSD

Conditional Areas Management Plan

Shellfish Management Area 20

**Shellfish Management Area 20
BROAD CREEK
CONDITIONAL AREA MANAGEMENT PLAN**

JULY 2004

I. AREA DESCRIPTION

The 2004 Annual Update includes the following written description of Broad Creek's Conditionally Approved area, in addition to a prior and a current classification map defining the Conditionally Approved area boundaries.

Broad Creek, from Station 03 to Station 25 (excluding all administratively Prohibited closure zones). The Conditionally Approved area will consist only of the main channel of Broad Creek between Stations 04A and 17B, excluding the closure zones. Between Stations 17B and 25, the Conditionally Approved area will consist of Broad Creek proper and adjacent marshes, excluding all closure zones.

The Broad Creek area was first classified as Conditionally Approved in the 1998 Annual Update. In January 2001, a portion of the Conditionally Approved area (between Stations 17B and 24) was leased by SCDNR to Richard Mitchell as Culture Permit C-031. The remainder of the Conditionally Approved area is open to the public for recreational harvesting.

Stations 03 and 15A were added to the Broad Creek Conditionally Approved area in the 2001 Annual Update, which extended the boundary to the mouth of Broad Creek at Calibogue Sound. Station 25 was classified for the first time in the 2002 Annual Update, and that area between Stations 24 and 25 was added to the Broad Creek Conditionally Approved area.

The Town of Hilton Head installed a kiosk at the Marshland Road boat landing on Broad Creek in 2003. A harvest classification map of the Broad Creek area, an Open/Closed sign for the Conditionally Approved area, and other shellfish harvesting information is included.

Stations 03, 15A, 04A, 17B, 18, 24, 25, 28, and 29 make up the Broad Creek Conditionally Approved area. Stations 03, 15A, 04A, 17B, 18, 24, and 25 meet the criteria for Approved classification in the 2004 Annual Update. Stations 28 and 29 are new stations with twelve samples for the review period. A minimum of thirty samples is required before the water quality classification can be determined.

For the review period, twenty-three samples were collected at each station in the Broad Creek Conditional Area while in the Open status. Analysis of that data indicates all stations in the Conditional Management Area meet the statistical criteria for Approved classification. In the 2003 Annual Update, Station 15, at the confluence of Broad Creek and Lawton Creek

was de-activated. The station was located within the Prohibited closure zone for the South Island WWTP discharge from the Forest Preserve wetland. Two new stations have been added in Broad Creek. Station 28 is located in Conditionally Approved waters adjacent to the Northern boundary of the Prohibited closure zone and station 29 is located at the Southern boundary. Water quality at these two stations will be utilized in management of the Broad Creek Conditional Management area.

Historically, the classification of stations 15A, 04A, and 17B have alternated between Restricted and Approved. Special sampling studies and analysis of routine shellfish sampling data indicates that water quality in the Broad Creek Conditionally Approved area is impacted by rainfall and stormwater discharges.

There are no mariculture operations in the area; therefore year round harvesting does not occur.

II. FACTORS INDICATING SUITABILITY OF BROAD CREEK AS A CONDITIONALLY APPROVED AREA

- A. The major pollution source adversely affecting water quality in Broad Creek is nonpoint source in origin.
- B. Broad Creek receives no substantial freshwater input other than from rainfall and associated runoff.
- C. Broad Creek has a tidal range sufficient to allow sufficient exchange with coastal ocean waters. This exchange results in a typical salinity range of 24 ppt to 30 ppt. Depressed salinities due to rainfall are temporary.
- D. Broad Creek is relatively small geographically and does not present major patrol difficulties.

III. PREDICTABLE POLLUTION EVENTS THAT CAUSE CLOSURE **Meteorological Events**

1. The Broad Creek Conditionally Approved area will be closed upon receipt of 1.40 inches or more of rainfall in a 24-hour period as measured by the Broad Creek PSD wastewater treatment plant personnel.
2. Analysis of data excluding samples taken following rainfall events of 1.40" or more in a 24-hour period collected during the shellfish harvesting season (September through May), indicates that Stations 03, 15A, 04A, 17B, 18, 24, and 25, will meet the statistical criteria for an Approved classification. This supports management of this area based upon rainfall of 1.40" or more in a 24-hour period. (See data summary table below).

FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Conditional Management Area Stations
collected while in Conditional Area Open (CAO) status
between
January 1, 2001 and December 31, 2003

Station #	03	04A	15A	17B	18	24	25
SAMPLES	23	23	23	23	23	23	23
GEO MEAN	3.1	6.4	5.4	5.2	5.8	7.3	5.3
90TH %ILE	8	19	17	15	19	25	21
WATER QLTY	A	A	A	A	A	A	A
CLASSIFICATION	CA	CA	CA	CA	CA	CA	CA

3. A review of rainfall data for the past five years (1999 to 2003) indicates that the area will receive an average of 2.4 rainfall events per year during shellfish harvesting season equal to or greater than 1.40". Although some events are likely to crossover, each event is considered to be separated from the subsequent event by a minimum duration of 14 days. With this in mind, one could expect the Conditionally Approved area in Broad Creek to remain in an open status during 86% (207 days) of the harvest season (September 16 through May 15; a total of 241 days).

Number of 24- hour Rainfall events \geq 1.40 inches Sept. 16 to May 15

1999	4
2000	3
2001	1
2002	2
2003	2

Total $12 / 5 = 2.4 / \text{yr}$ $2.4 \times 14 \text{ day closure} = 33.6 \text{ days closed}$
 $(33.6 / 241 \text{ days in harvest season} = 14 \% \text{ closed, } 86\% \text{ open})$

3. Any significant input from migratory waterfowl populations is offset by tidal flushing.

IV. IMPLEMENTATION OF A CONDITIONAL AREA CLOSURE

The Low Country EQC District Shellfish program manager is the responsible party for determining compliance with all aspects of this plan, including the tracking of rainfall criteria violations. In the event that the manager shall be unavailable, a responsible employee shall be

designated responsibility for tracking, compliance, and notification procedures.

A. Implementation of Closure (September through May): The following procedures shall be used in the event a closure is necessary:

1. The State Shellfish Sanitation Program Manager (or his designee) shall be notified upon determination of the need for any closure. Media shall be coordinated through the Shellfish Sanitation Program and the of Media Relations.
2. The Office of Media Relations (Media Relations) is the responsible authority for issuance of news releases. Media Relations shall be notified within four hours of the determination of the need for a closure. They shall be provided with specific information regarding the pollution event and affected area. In the event of the need for a weekend or holiday closure, Media Relations shall
3. Within four hours of a determination of the need for a closure, District Shellfish staff shall notify the South Carolina Department of Natural Resources (SCDNR), Office of Commercial Fisheries Management, & SCDNR Law Enforcement, by telephone and/or fax.
4. District Shellfish Sanitation Program staff shall notify certified Shellfish Shippers with interests in the affected area. SCDNR is the State agency having authority for the issuance of individual commercial shellfish harvest permits and should provide notification to individual permittees.
5. Prior to September 16, SCDHEC shall post an adequate number of “Warning Conditional Area” signs throughout the area. Additionally, maps indicating the current condition of the affected area will be posted at locations adjacent to the area suitable for public information display. Map postings shall take place immediately following issuance of the draft news release.
6. During the closure period, District Shellfish Sanitation Program officers shall insure patrols are conducted at a frequency sufficient to deter illegal harvest activities. Schedules shall include night and weekend patrols. Documentation of these patrols shall be maintained. Unless a district Shellfish Sanitation Program officer has personal knowledge that a violator has been notified of the closure, under no circumstance shall a summons be issued during the first 48 hours following the initial call to Media Relations. Written warnings should be issued during this 48 hour period and all shellfish should be returned to the water.

B. Management of Conditional Areas Extraneous to the Normal Shellfish Harvest Season

The Broad Creek Conditionally Approved area shall remain in the closed status from May 15 through September 15.

C. Enforcement of Closures

1. DHEC is the agency responsible for public health protection. This includes public notice and closures of shellfish management areas.
2. District Shellfish Sanitation Program officers shall insure that the area is patrolled at a frequency adequate to prevent illegal harvesting. Documentation of these patrols shall be maintained. District Shellfish Sanitation Program officers may coordinate with other law enforcement officers to insure adequate area coverage

V. CONTROL ELEMENTS USED TO REOPEN AFTER A POLLUTION EVENT

Opening of areas following closure due to violation of management plan criteria shall adhere to the following control elements.

- A. The area shall remain closed for a minimum period of 14 consecutive days following the end of a rainfall event. If, during the initial closure period, a subsequent event occurs that meets the criteria for a closure, the area shall remain closed for 14 consecutive days following the occurrence of the subsequent event.
- B. The bacteriological water quality at all stations located within, or on the boundary of, the closed Conditionally Approved area shall be assessed prior to reopening. For the year 2004 report this shall include Stations 03, 15A, 04A, 17B, 18, 24, 25, 28, and 29. The area shall remain closed and be re-sampled at a later date if any sample exceeds a fecal coliform MPN of 43.
- C. District Shellfish Sanitation Program staff and the State Shellfish Sanitation Program Manager (or his designee) shall concur on the decision to reopen the area.
- D. District Shellfish Sanitation Program staff shall notify SCDNR, Division of Commercial Fisheries Management, of the opening following issuance of the news release.
- E. Local Certified Shellfish Shippers shall be notified by SCDHEC of the opening as soon as possible.
- F. Map postings shall be updated to reflect the open status.

VI. MANAGEMENT PLAN EVALUATION

This plan shall be evaluated once per year and included as a part of the Shellfish Management Area 20 Annual Update.

Shellfish Management Area 20
BROAD CREEK
EVALUATION OF CONDITIONAL AREA MANAGEMENT PLAN
JULY 2004

1. BACKGROUND INFORMATION

The following is a description of the Area 20 Conditionally Approved areas as indicated in the July 2004 Annual Update.

Broad Creek, from station 03 to station 25 (excluding all administratively Prohibited closure zones). The Conditionally Approved area will consist only of the main channel of Broad Creek between stations 04A and 17B, excluding the closure zones. Between stations 17B and 25, the Conditionally Approved area will consist of Broad Creek proper and adjacent marshes, excluding all closure zones.

A map indicating the Area 20 Conditionally Approved area boundaries is included in the 2004 Annual Reports

The evaluation period is calendar year 2003. Closure of the Conditionally Approved area was based on rainfall of 1.40" or greater in a 24-hour period. Rainfall is measured at the Broad Creek PSD WWTP.

There is no mariculture activity within this area therefore year-round harvesting is not allowed.

2. REEVALUATION OF CONDITIONAL CLASSIFICATION

During the shellfish harvest season, there were two rainfall events greater than or equal to 1.40":

Date	Event	Sample Date	Reopening Date
3-7-03	Closed Area- Rainfall (1.48")	3-11-03	3-21-03
10-28-03	Closed Area- Rainfall (3.58")	11-05-03	11-12-03

3. COMPLIANCE WITH MANAGEMENT PLAN

For the evaluation period, the Broad Creek Conditional Management area was managed in accordance with the plan.

4. COOPERATION OF PERSONS INVOLVED

Cooperation by Broad Creek WWTP personnel in reporting rainfall events exceeding

management plan criteria was prompt. WWTP personnel readily supply necessary rainfall data upon request.

5. EVALUATION OF WATER QUALITY WITH RESPECT TO THE BACTERIOLOGICAL STANDARDS FOR ITS CLASSIFICATION

For the Annual Update review period (January 1, 2001 through December 31, 2003) for Shellfish Management Area 20, water quality at Stations 03, 15A, 04A, 17B, 18, 24, and 25 in Broad Creek met the statistical criteria for an Approved classification (Table 2(A), Area 20 Annual Update). However, due to potential water quality variability along with the knowledge that stormwater runoff can have an adverse impact on water quality and public health, these stations have been classified as Conditionally Approved.

For the review period, analysis of samples collected at Stations 03, 15A, 04A, 17B, 18, 24, and 25 in the Broad Creek Conditional Area while in the Conditional Area Open status (CAO), indicates these stations meet the statistical criteria for Approved classification.

FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Conditional Management Area Stations
collected while in Conditional Area Open (CAO) status
between
January 1, 2001 and December 31, 2003

Station #	03	04A	15A	17B	18	24	25
SAMPLES	23	23	23	23	23	23	23
GEO MEAN	3.1	6.4	5.4	5.2	5.8	7.3	5.3
90TH %ILE	8	19	17	15	19	25	21
WATER QLTY	A	A	A	A	A	A	A
CLASSIFICATION	CA	CA	CA	CA	CA	CA	CA

6. RECOMMENDATIONS

The rainfall amount should remain at 1.40" in a 24-hour period and be re-evaluated for the area on an annual basis.